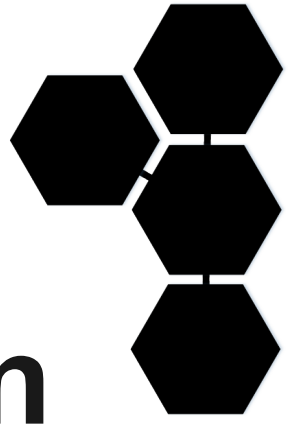
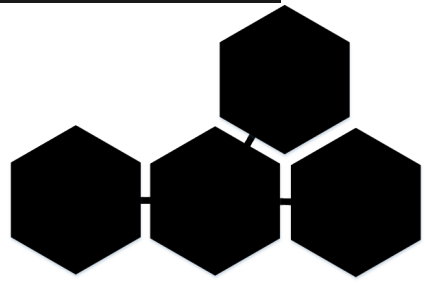


Python microservices on PaaS done right

Michał Bultrowicz



About me

- Work at Intel Technology Poland.
- I do backend services.
- Sadly, mainly in Java.
- I did some C++ security...
- ...and multiplatform distributed automated testing soft.
- I really, really like Python.
- It’s my first time presenting.

Thanks for the help

Izabela Irzyńska

Agenda

1. Microservices introduction.
2. PaaS introduction.
3. Ingredients of a sane project (with microservices and PaaS).
4. Using Python for that project.
5. Other tools and procedures that you need.

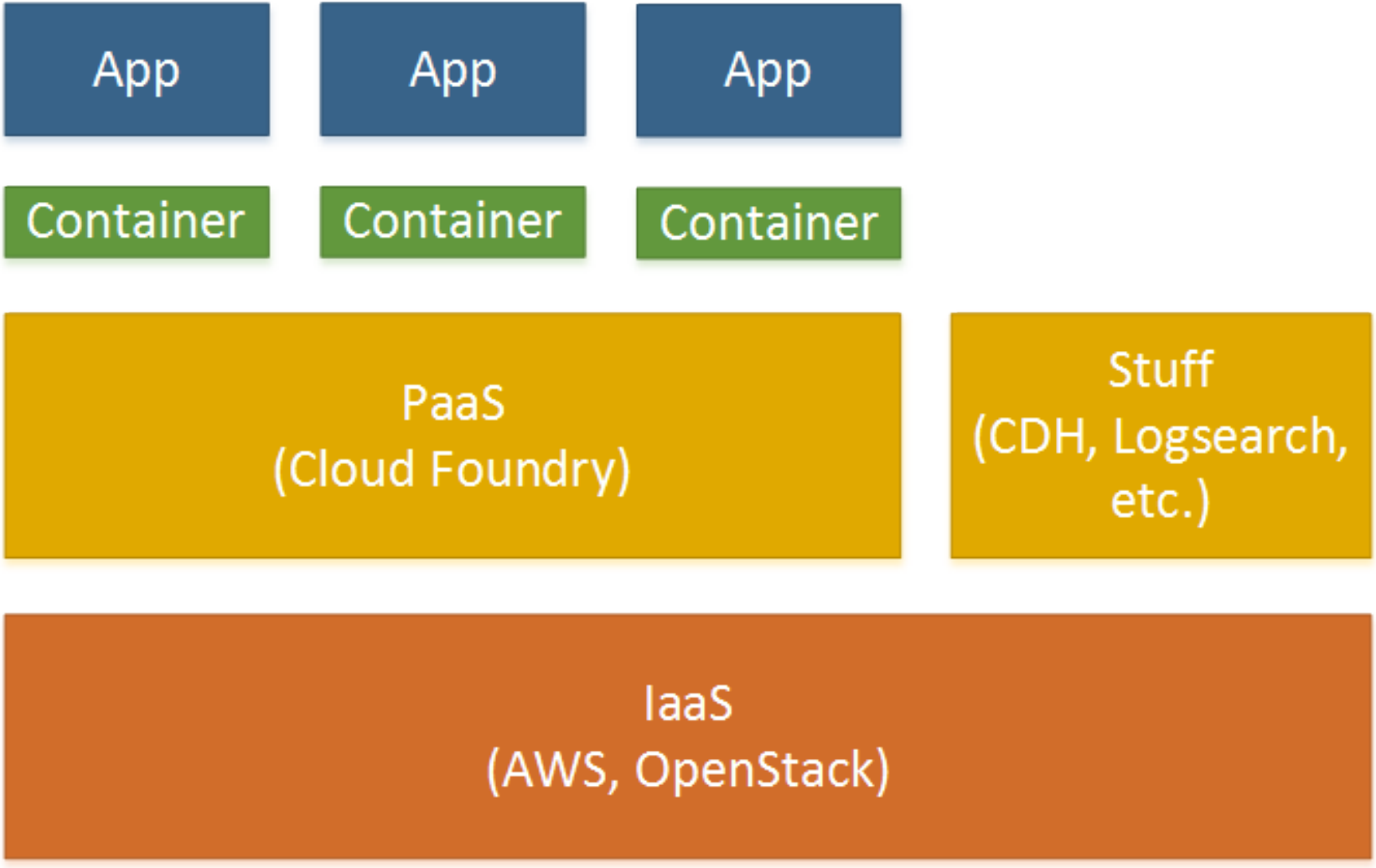
Microservices

- Independant
- Cooperating
- Scale well (e.g. Netflix)
- “Small”
- 12factor.net
- Way to handle big teams

Platform as a Service

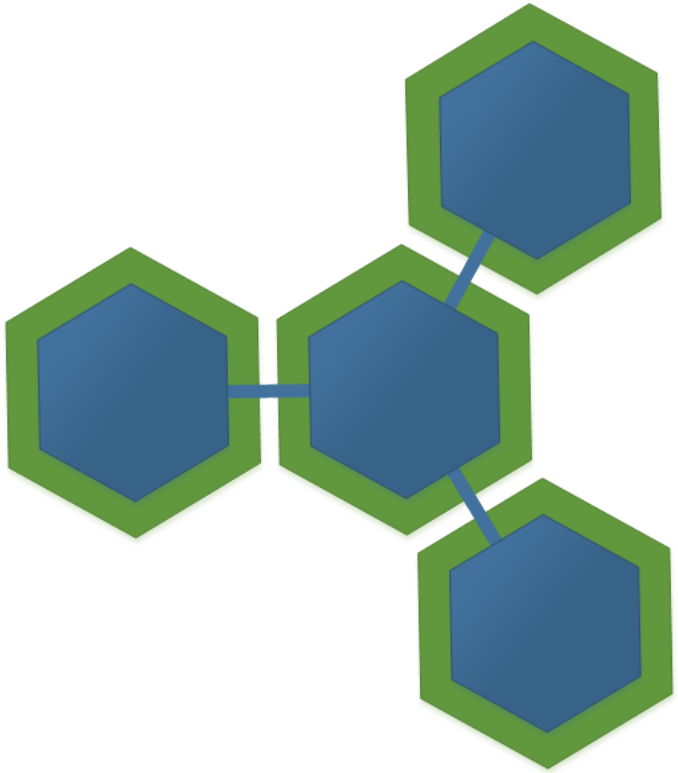
- Cloud for applications, not (virtual) machines
- Encapsulates applications
- Eases connecting apps together
- Simplifies deployment
- Helps with logging

http://www.paasify.it/vendors


App
App
App
Container
Container
Container
PaaS
(Cloud Foundry)
Stuff
(CDH, Logsearch,
etc.)
IaaS
(AWS, OpenStack)

Microservices on PaaS

- The way to go
- Increase the benefits
- Easy scaling
- Adaptability
- Testable
- Measurable



Not a silver bullet

- Really painful without good automation
- Communication overhead
- Performance overhead
- Risky to start without a monolith

http://martinfowler.com/bliki/MonolithFirst.html

Microservices requirements

1. Twelve factor applications
2. Automated multi-tier testing
3. Continuous delivery pipeline
4. Insight/metrics
5. Proper management
6. Platform versioning

Why use Python for that?

- As many features/libraries as anything else (or more).
- Fast prototyping.
- Easy testing (but static type checking wouldn’t hurt...).
- Good at loose coupling
- Deterministic garbage collection (weakref)
- It’s enjoyable.
- More...

Sufficient performance

- Don’t trust me! Or anyone! (with benchmarks)
- Falcon + uWSGI vs. Spring Boot + Tomcat

	Req/s	mean ms/req	failed reqs	50th pct < (ms)	75th pct < (ms)	95th pct < (ms)	99th pct < (ms)	Max
Falcon	722	1490	2.8%	59	1038	11782	22376	52193
Spring	585	5924	0.7%	5421	6484	11293	28092	39639

The app

- Enter Falcon!
- Light!
- Fast!
- No magic!
- ...young…
- I’m not on the team

```
# app.py

import falcon
import json

class SampleResource:

    @staticmethod
    def on_get(req, resp):
        resp.body = 'Hello world\n'


app = falcon.API()
app.add_route('/', SampleResource())
```

http://falconframework.org/

```python
# app.py

import falcon
import json

class SampleResource:

    @staticmethod
    def on_get(req, resp):
        resp.body = 'Hello world\n'

    # THE NEW THING
    @staticmethod
    def on_post(req, resp):
        '''
        Given JSON input returns a JSON with only the keys that start with "A" (case insensitive).
        '''
        if req.content_type != 'application/json':
            raise falcon.HTTPUnsupportedMediaType('Media type needs to be application/json')
        # PYTHON 3
        body_json = json.loads(req.stream.read().decode('utf-8'))
        resp.body = json.dumps({key: value for key, value in body_json.items() if key.lower().startswith('a')})


app = falcon.API()
app.add_route('/', SampleResource())
```

CloudFoundry app

```
example_app
├── example_app
│   └── app.py
├── tests
│   ├── test_app.py
│   └── requirements.txt
├── service_tests
│   ├── test_service.py
│   └── requirements.txt
├── requirements.txt
├── tox.ini
├── manifest.yml
├── runtime.txt
└── .cfignore
```

manifest.yml

```yaml
---
applications:
- name: example-app
  command: uwsgi --http :$VCAP_APP_PORT --module example_app:app # etc.
  memory: 128M
  buildpack: python_buildpack
  services:
    - redis30-example
    - other-example-app-service
  env:
    LOG_LEVEL: "INFO"
    VERSION: "0.0.1"
```

Continuous delivery

DO IT OR DIE

CD flow

$ git clone --recursive <app_repo>

$ tox

$ bumpversion micro

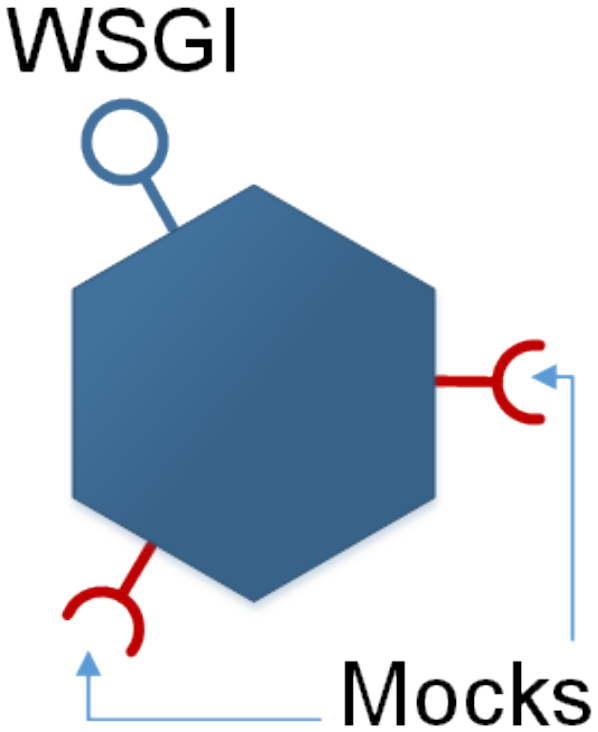
$ cf push

$ python3 test_e2e.py

$ cf target <production_env>

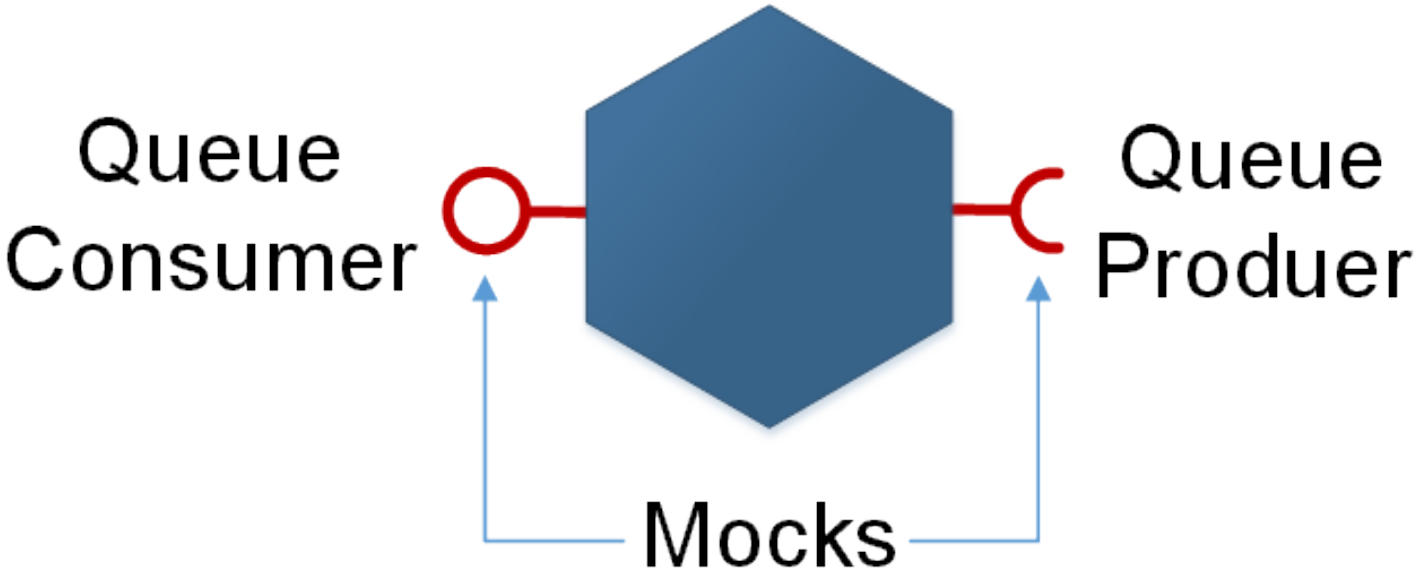
$ cf push

Unit testing - HTTP

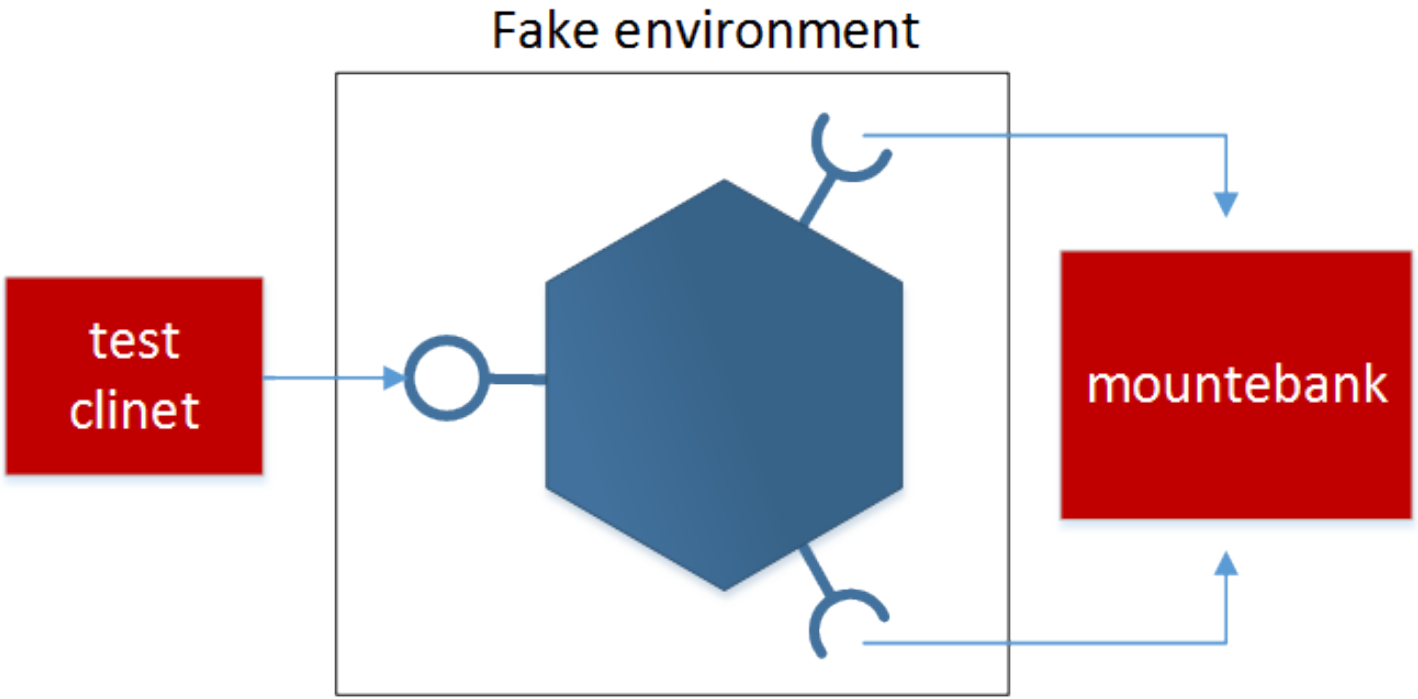


```python
#test_app.py

import json
from falcon import testing
from falcon_app.app import app

class SampleTest(testing.TestBase):

    def setUp(self):
        super().setUp()
        self.api = app

    def test_sample_post(self, original_dict, expected_dict):
        response = self.simulate_request(
            '/',
            decode='utf-8',
            method='POST',
            body=json.dumps({'abra': 123, 'kadabra': 4}),
            headers=[('Content-type', 'application/json')]
        )

        self.assertEqual(
            response,
            json.dumps({'abra': 123})
        )
```

Unit testing - pub/sub



Service testing



Tox config

- Unit and service test
- Only one Python version.
- No packaging (skipsdist=True)
- Full app analysis (coverage, pylint, etc.)
- Run on dev and CI machines

YOLO SWAGGINS

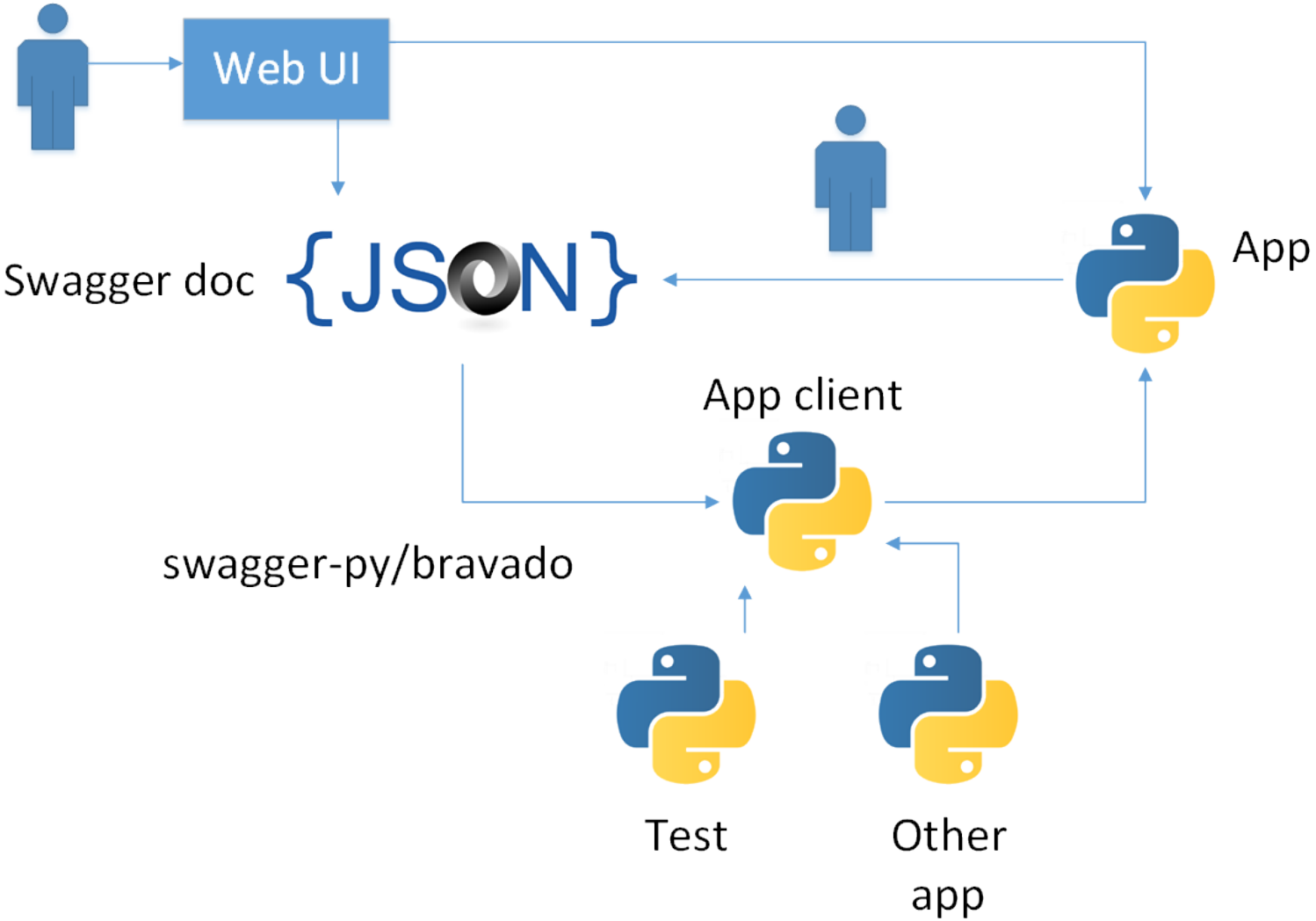
And the fellowship of the bling

Swagger - live API docs

pet : Everything about your Pets

Show/Hide | List Operations | Expand Operations

POST	/pet	Add a new pet to the store
PUT	/pet	Update an existing pet
GET	/pet/findByStatus	Finds Pets by status
GET	/pet/findByTags	Finds Pets by tags
DELETE	/pet/{petId}	Deletes a pet
GET	/pet/{petId}	Find pet by ID
POST	/pet/{petId}	Updates a pet in the store with form data
POST	/pet/{petId}/uploadImage	uploads an image


Web UI
Swagger doc
{JSON}
App
App client
swagger-py/bravado
Test
Other app

E2E/acceptance tests

- Done in staging env
- Run after each commit to master
- ...or nightly
- Only crucial journeys through the system
- Owned by everybody, monitored by selected

Monitoring

- In staging and production.
- State of PaaS resources.
- Periodically runs E2E.
- E.g. Zabbix

Logs and metrics

- All apps log to std out
- Cloud Foundry gathers all logs in a stream
- Logsearch: Cloud-scale ELK
- InfluxDB for real-time metrics

Management tips

- Every app needs an owner
- ...and an additional reviewer
- Review mercilessly
- Nobody is unquestionable
- Architecture visualisation

Platform deployments

- Custom implementation
- E.g. a big manifest binding others together
- Can increase the risk of coupling

More info

- Sam Newman, *Building Microservices*, O'Reilly
- http://martinfowler.com/articles/dont-start-monolith.html
- http://martinfowler.com/bliki/MonolithFirst.html
- http://martinfowler.com/articles/microservice-testing/
- http://docs.cloudfoundry.org/
- http://www.logsearch.io/
- http://www.cloudcredo.com/how-to-integrate-elasticsearch-logstash-and-kibana-elk-with-cloud-foundry/
- uWSGI performance: http://blog.kgriffs.com/2012/12/18/uwsgi-vs-gunicorn-vs-node-benchmarks.html, http://cramer.io/2013/06/27/serving-python-web-applications/
- https://speakerdeck.com/gnrfan/restful-microservices-with-python
- EuroPython 2015 talks: "Nameko for Microservices", "Beyond grep: Practical Logging and Metrics", "A Pythonic Approach to Continuous Delivery"